Quantum Electronics 2018 vol.48 N1, pages 82-86

Temperature sensor based on a polymer diffraction grating with silver nanoparticles

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Abstract

© 2018 Kvantovaya Elektronika and Turpion Ltd. The method is suggested for producing an optical temperature noncontact sensor on a polymer polymethylmethacrylate (PMMA) substrate with a diffraction optical element formed by implanting low-energy high-dose silver ions through a surface mask. Ion implantation is performed at an energy of 30 keV, a radiation dose of 5.01016 ion cm-2 and an ion beam current density of 2 mA cm-2 through a surface metal mask having the form of grid with square periodical holes (cells) of size 25 mm. In the course of implantation, silver nanoparticles are produced in periodical unmasked domains of irradiated PMMA. Operation of the temperature sensor on diffraction microstructures made of polymer with silver nanoparticles is demonstrated in the range from 20 °C to 95 °C by testing it with a probe radiation of a He - Ne laser.

http://dx.doi.org/10.1070/QEL16499

Keywords

Laser thermometry, Optical diffraction, Optical polymer materials, Plasmon absorption, Silver nanoparticles, Temperature sensor

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